

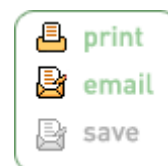
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## The Case for Creativity in Math Education

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"Mister, when am I ever going to use this?" When I started out as a new math teacher, these were the words I hated to hear because often, I wasn't so sure myself. In my own life as a math student, the sheer un-usability of the material was a big draw. As a teen, I could not figure out my life, but in this abstract world of math, I could resolve all my problems.

But once I started teaching, I realized that my own love of doing math was not enough. Some students got excited by the neat rationality of math. But most were uninspired. My internal motivators (love of math) and external motivators (desire to do well on the SAT tests) didn't translate to most of my students. So I began to rethink why it is important for all of us to learn math. What could I do to make all students see the beauty, fun and power in math?

Now, in response to questions about the importance of math, I explain that in our society, even though it may not be fair, math abilities equal smarts. People who can demonstrate skill with mathematics have more doors open to them than those who cannot. And learning math is important because math was created by humans. When you trace the history and development of math, you really see the development of thinking. A math textbook, without always acknowledging it, contains wisdom from ancient cultures and the accumulated history of human thinking. We should all be part of that.

So after 11 years of teaching, the question I worry about now is "How do we do this well?" How do we engage students in math classes? How do we convince them that math is beautiful, fun and powerful? If we can engage students in the right way, then they'll be too busy to stop to ask, "When am I ever going to use this?"

For the math department at my school, Boston Arts Academy (BAA), the answer has been to infuse creativity into math classes. While still concerned with math standards and content, we focus on whether students have a chance to make choices and connect to their other passions. We want our students and teachers to feel like they are inventors as they create and solve problems. But what does it look like to be creative in math class, and why should we bother?

At BAA, being creative starts with the teachers. BAA is a pilot school within the Boston Public Schools, which allows us a lot of free rein to develop and implement our own ideas. My department and I have been able to create a curriculum that is still a work in progress. It's not yet beautiful, and it's far from realizing its full potential. But it is ours, and it grows and changes as we in the department continue to grow and change. As we've built this project-based curriculum, we have realized that after two or three years, a piece of the curriculum often needs to be improved or replaced because our thinking about what makes a good project continues to evolve. We teach new courses or have new perspectives on courses we've taught for years. The result: at every math level, we revise at least one project annually. Sometimes this means we throw out curriculum that works fine. Sometimes this means we try out new stuff that completely bombs. This can feel like building a sandcastle during high tide. We keep building new curriculum knowing that we'll never really be in a place where we feel "done." It can be frustrating, but the alternative – we decide to keep what we've got and make no changes – would mean that the department had stagnated and that we have stopped using our creative skills to develop new ideas. For us, being creative means taking risks, trying new things, and continuing to revisit and reinterpret what we're doing, even when we know we're doing it well.

One danger in being creative teachers is that we might veer off course, that we could confuse "new" with "good" and make wanton changes that are bad for students. This is one reason we recently hosted a half-day tuning protocol, which was a chance to get feedback on our evolving curriculum from professionals from

other schools and members of the BAA community. The value of pausing to make our work public was twofold: First, we got feedback from outsiders. They told us that we're doing a lot of things well but that we should better articulate course themes and essential questions. To outsiders, some of our course descriptions felt like a random collection of projects instead of a cohesive learning experience. The second benefit of the tuning protocol was that the preparation required our department to work together, to find out what's going on in each other's classrooms and to think about what we're doing and where we would like to improve. The team had to articulate frustrations and turn them into focus questions. We had to document our work so that it could be comprehended by an outside audience. Teaching can often be such a private endeavor –we often don't know what's going on in the classroom next door. But by preparing for this tuning protocol, we were able to learn more about what we are doing and what we'd like to be doing in our classrooms.

We've realized that students also need to feel some sort of creative opportunity in order to feel engaged. This means teaching content within a project-based approach. We introduce traditional math skills, we practice those skills, and we take tests and quizzes on these skills. And we always make sure that students can apply those skills in meaningful ways through unit projects. In our best unit projects, there are four Cs that we consider:

**CONTENT** – We create our unit projects with rich math content at their core. We strive to find projects that not only require students to do good math, but in which doing the math is integral to completing the project.

**CONNECTION** – We make sure that there is an authentic, non-superficial connection to the real world and to other disciplines. At our school, this often means trying to connect our work to the visual and performing arts. But our best projects do more than just connect; they actually require students to use different disciplines and different multiple intelligences to complete the job.

**CHOICES** – Our best projects allow students to make choices and solve problems in different ways. There are chances for students to “muck around” with the math rather than just follow one linear pathway. This often means posing questions that do not have one “right” answer.

**CO-AUTHORSHIP** – We've found that students' engagement and achievement is highest when students can have a role in creating their problems as well as finding the solutions. Sometimes this means letting students change the setting or context of a problem, such as when Raphael transformed a boring problem about linear functions into a study about gas mileage that connected to his passion for motor bikes. Or this can mean giving students some constraints and having them come up with their own problems.

When combined properly, these four Cs ensure that math class can feel like a creative endeavor. We certainly don't have it all figured out. We continue to feel stretched for time and often feel in a tug-of-war between what we want to do and what we must do (preparing for state tests is the most significant “must-do”). We often run out of planning time and energy, so our best intentions and our philosophies don't always manifest themselves. And really, some topics benefit from a good old-fashioned lecture followed by traditional drilling.

But most days we feel like we're moving in the right direction. Although we've used different buzzwords throughout the years – arts-infused, project-based, multiple-intelligences, interdisciplinary – the consistent idea has been breaking the mold of traditional math classes and using our own creativity. When students and teachers can feel creatively connected to the curriculum, we circumvent the question, “When are we ever going to use this?” Instead, we focus on what we're going to create with these new skills. As teachers, we also model the ability to create and support our students' ability to create on their own.

What I liked about math as a student is now what I don't like about it as a teacher. As a student, I loved math for its neat resolutions and final answers. As a math teacher, I've realized that I don't want neat conclusions anymore. I want to feel like the work I'm doing and the curriculum we're developing is moving in a certain direction, and remains a “work in progress.”

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